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THESIS

**RADIOMEN STAFFING LEVELS
FOR THE UNITED STATES COAST GUARD
PACIFIC AREA COMMUNICATION SYSTEM**

by

Steven M. Barker

September, 1991

Thesis Advisor:

Dan C. Boger

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Radiomen Staffing Levels
For The United States Coast Guard
Pacific Area Communication System

by

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Lieutenant, United States Coast Guard
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Submitted in partial fulfillment
of the requirements for the degree of

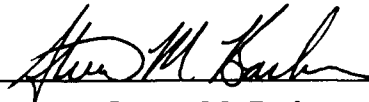
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ABSTRACT

The United States Coast Guard maintains four communication stations (COMMSTAs) with the responsibility of providing communication services throughout the Pacific Ocean maritime region. A study of the functions performed at these four stations is presented, their Radiomen staffing level is determined using the current staffing standard and the workload model, and their authorized staffing level is compared. A proposal is made to create one operations facility for the Pacific Area Communication System, where the workload from the four facilities is performed under one roof. The Radiomen staffing level for the proposed facility is determined and compared to the overall staffing level of the four COMMSTAs. The results of this study is that there is a savings of personnel when the four facilities are consolidated. There are discussions qualifying the results of the study with respect to what watch positions may need additional Radiomen. There also are discussions of some potential inaccuracies when using the workload model.



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I. INTRODUCTION

A. OVERVIEW

The United States Coast Guard has four communication stations (COMMSTAs) that provide command and control as well as other support communication services throughout the Pacific Ocean maritime region [Ref. 1: p. K-1]. Each COMMSTA has an area of responsibility and a specific set of communications jobs, or missions, that are assigned by the Pacific Area Commander (COMPACAREA) [Ref. 1: pp. K-2, K-4 - K-6]. There are similarities in these assigned missions so that, if the equipment at each COMMSTA was to be remotely controlled from one location, work load savings might be realized. Radiomen (RMs) operate the communications equipment at these COMMSTAs, and a consolidated facility might lead to a lower staffing level for RMs in the PACAREA Communication System (PACCOMSYS).

Current staffing levels for each COMMSTA are determined by a staffing standard established by Coast Guard Headquarters and published in Commandant's Instruction (COMDTINST) M5312.11. A new staffing study was conducted in 1990 by CAE-LINK Corporation which was under contract to the Office of Personnel Management. That study is a part of the U.S. Coast Guard Technician Force Job Analysis and Manpower Utilization Study. The statistics from that study were used in drafting a new RM staffing standard [Ref. 2: p. 1-1].

B. SCOPE

The thrust of this thesis is to look to the future in Coast Guard communications and describe a possible outcome of personnel staffing if the operators' workload for the PACAREA Communication System (PACCOMSYS) were combined and performed at one location. A description of the PACCOMSYS, including the assigned missions, workload, and Radiomen staffing levels at the four PACAREA COMMSTAs will be provided.

An understanding of the staffing standard for RMs based on the new staffing study and the new draft standard will also be necessary. The assumptions made by the staffing study personnel and the model used in the study have an effect on the factors that determine the RM staffing level. This thesis assumes that the study results are well grounded in theory and will not try to determine the study's validity.

Much of the information supporting this thesis is found in various Coast Guard publications and draft reports. Interviews with responsible persons at the four COMMSTA facilities, as well as with subject matter specialists at Coast Guard Headquarters and CAE-Link Corporation, were also necessary to obtain information not already incorporated in written materials. Documented message count statistics for the summer of calendar year 1990 will be used to determine workload at the four COMMSTAs.

By assuming common missions and that workload can be consolidated at one area master station, a new staffing level for the personnel who would remotely control the equipment at the four current COMMSTA facilities can subsequently be

determined. This new staffing level will be compared to the staffing level that each separate facility should have, based on the new standard. And because the new standard has not been implemented in the field, these levels will be compared to the unit's current staffing authorization.

This thesis will not develop an engineering model for consolidation of the operations facilities. A cost/benefit analysis to determine the feasibility of such a facility would be appropriate only after further study of the engineering costs.

C. CHAPTER OUTLINE

The first chapter is the introduction to the thesis. It provides an overview that describes the topic of the thesis. The introduction also provides the scope of the thesis, what will be examined, and what will be written.

The second chapter has the background information for the Pacific Area Communication System. This information is necessary to show the overall mission areas in Coast Guard communications and to better understand what work RMs are performing when discussion of their workload is presented in the subsequent chapter.

Chapter III is the discussion of the RM staffing standard, both in general and specifically for communication stations. An accurate workload model of the proposed facility, done by combining the mission area functions of the four COMMSTAs, can only be accomplished by gaining an understanding of the statistics in the staffing study and an understanding of the subsequent staffing standard.

The specific attributes of the four PACAREA communications facilities will be discussed in Chapter IV. This includes a list of their individual mission requirements and their present staffing levels for RMs. Also in this chapter, their 1990 message traffic workloads will be used to determine their staffing level requirement based on the new RM staffing standard.

The fifth chapter will describe the missions that could be performed at one location and then show the combined workload. The missions that are peculiar to one COMMSTA and cannot be consolidated will also be identified. The staffing level required to perform the work for the combined facility will subsequently be determined.

In conclusion, the staffing levels for RMs in the present communications facilities and the staffing level of the proposed combined facility will be compared. This leads to a discussion of factors that may affect the results of staffing level determinations as well as highlight possible further areas of study.

II. PACIFIC AREA COMMUNICATION SYSTEM

A. OVERVIEW

The PACCOMSYS primarily exists to provide communications capability for the Coast Guard's Pacific Area Commander to exercise command and control over the Coast Guard units deployed in the Pacific region. This also includes supporting the command and control responsibilities of the Coast Guard district commanders within the PACAREA. The four Coast Guard communication stations (COMMSTAs) that make up the PACAREA COMMSYS are

- Coast Guard Communications Area Master Station, Pacific (CAMSPAC), Point Reyes, California.
- Coast Guard COMMSTA Kodiak, Alaska.
- Coast Guard COMMSTA Honolulu, Hawaii.
- Coast Guard Radio Station (RADSTA), Guam.

CAMSPAC is the system control station for the PACCOMSYS and is responsible for the routine operational coordination of the system. In performing this function, CAMSPAC coordinates frequency use, circuit assignment, and traffic loading and equalization on the circuits. Additionally, CAMSPAC coordinates efforts with the three other communication stations when restoring communications with deployed units or within the system.

The PACAREA COMMSTAs are the Coast Guard's link between the shore-based networks and the long-haul radio systems used to communicate with aircraft and ships operated by the Coast Guard, Navy, and other government or commercial organizations. They are interconnected with shore-based networks and can perform mission responsibilities for each other in the event of overloading or equipment casualty.

There are a variety of Coast Guard missions for which a COMMSTA processes message traffic, including law enforcement and search and rescue. COMMSTAs process continuous wave (Morse Code), voice, and radio teletype. The duties required of the four PACAREA COMMSTAs also include guarding (continuous listening to) specified international distress frequencies and responding to emergency signals on other frequencies.

Because of the distances between the Pacific Area COMMSTAs, each performs a majority of these mission functions in its geographical area of responsibility.

Connectivity is important to the overall performance of the system.

B. SHORE-BASED NETWORKS

The shore-based networks provide the majority of the connectivity between the PACAREA COMMSYS stations, PACAREA Commander, and district offices. These networks include the message transfer and distribution system, the secure command and control teletype network and the automatic digital network.

1. Message Transfer And Distribution System

First of all, each of the COMMSTAs, with the exception of RADSTA Guam, is connected on the Message Transfer and Distribution System (MTDS) which is the Coast Guard's packet switching network and is the backbone network for unclassified message traffic. MTDS connects the Pacific Area District Commanders and COMMSTAs with the Pacific Area Commander primarily for search and rescue, distress and operational traffic. If MTDS use is not being maximized, it also can be used for lower precedence traffic such as Automated Mutual-Assistance Vessel Rescue System (AMVER) reports, weather observations and other administrative traffic.

2. Secure Command And Control Teletype Network

The Pacific Area Secure Command and Control Teletype Network (SCCN) is another network used by PACAREA COMMSYS. SCCN provides a direct, rapid, and secure communications link for the operational commanders and their units in the Pacific Area. CAMSPAC is the network control station for SCCN and handles the day-to-day management. COMMSTAs Honolulu and Kodiak are connected to the network as hubs where they can connect other users upon request. The COMMCENs of the Pacific Area districts are connected as users at all times. SCCN can be used in a broadcast mode by any terminal on the network to all other terminals in the network, or it can be set up in a selective mode for two or more terminals to be selectively linked on the circuit. SCCN is used for secure conferences between operational commanders and afloat units, exchange of traffic among the COMMSTAs for system

coordination, and it can be used as an alternate routing circuit when CAMSPAC deems it necessary.

SCCN is presently being replaced by the Secure Data Network (SDN). SDN will be configured the same as SCCN but, through the use of the Coast Guard standard workstation computer in combination with STU-III phone encryption devices, will provide the transfer of messages and data over phone lines at greater speeds and less cost [Ref. 1: p. K-4-5].

3. Automatic Digital Network

The PACCOMSYS is connected with the Automatic Digital Network (AUTODIN) using the Naval Communications Processing and Routing System (NAVCOMPARS) at both CAMSPAC and RADSTA Guam. There is also an AUTODIN termination at COMMSTA Kodiak. The majority of the Coast Guard's sensitive and classified message traffic is handled over AUTODIN, providing connectivity via this Department of Defense operated network.

C. RADIO SYSTEMS

1. Continuous Wave

Continuous wave (CW) is used for broadcasting or the exchange of weather information and administrative or distress traffic, and it supports the National Marine Fisheries Service (NMFS) with enforcement of fishing laws and treaties. The CW broadcast is transmitted from each PACCOMSYS COMMSTA/RADSTA and carries marine information broadcasts including notice to mariners, hydrographic information,

storm warnings and advisories. COMMSTA Honolulu and RADSTA Guam both transmit an additional scheduled CW broadcast to Navy operated vessels not equipped to receive message traffic over the Navy Telecommunications System. The information and message traffic for this broadcast is assembled through NAVCOMPARS. Additionally, the international CW distress frequency is currently the 500 KHZ band. All COMMSTA/RADSTAs maintain a continuous guard of this frequency and keep a log of all signals heard. Support of the Coast Guard operated AMVER system can also be CW.

2. Voice Systems

The PACCOMSYS supports three voice radio systems: the system coordination network, air-to-ground communications, and marine weather forecast broadcasts.

a. System Coordination Network

The active System Coordination Net (SCN) frequencies are monitored and used by each COMMSTA/RADSTA. SCN is the ship-to-shore voice network used to coordinate communications between Coast Guard, other government agencies, Navy vessels, and aircraft. Voice traffic is exchanged on SCN and can also be used for distress frequencies for the maritime public.

b. Air-to-Ground Communications

Air-to-ground communications are provided to Coast Guard aircraft by all four stations of the PACCOMSYS. This can be accomplished through a phone

patch arrangement where the operator connects the telephone system directly to an HF transmitter and receiver and manually keys the transmitter, or the operator can relay information to the air station or other district unit via voice or facsimile machine.

c. Voice Marine Weather Forecast Broadcast

All four stations also perform voice marine weather forecast broadcasts. The text of these broadcasts is prepared by the National Weather Service, transmitted to the station via landline teletype circuit, and then read by the Coast Guard radio operator over HF at scheduled times throughout the day.

3. Radioteletype

Radioteletype is used to exchange traffic between the four PACCOMSYS stations and the Coast Guard cutters, Coast Guard aircraft, and the merchant vessels they are serving. The systems used are Simplex Teletype Over Radio (SITOR), Navigation Warning Broadcast (NAVTEX), ship-to-shore encrypted and unencrypted service as well as air-to-ground unencrypted radioteletype.

a. Simplex Teletype Over Radio

SITOR is a highly reliable, narrowband, direct printing circuit that is used for sending and receiving AMVER reports and broadcast navigation and weather warnings.

b. Navigation Warning Broadcast

The NAVTEX broadcast is operational at all PACAREA COMMSTAs. NAVTEX provides an automated warning broadcast on 518 KHZ which is received on board vessels on a low cost receiver/printer.

c. Ship-to-Shore and Air-to-Ground Radioteletype

Ship-to-shore encrypted radioteletype (RATT) circuits are an extension of the SCCN that was discussed earlier. Secure ship-to-shore circuits are for Coast Guard and Navy vessels that require connectivity with AUTODIN, NAVCOMPARS, and ODIN. The unencrypted ship-to-shore circuits support other government and Coast Guard vessels that are not equipped with secure capabilities.

To supplement the labor intensive ship-to-shore RATT, a new technology being installed at COMMSTAs and on board Coast Guard vessels is the High Frequency Data Link (HFDL) radio system. It approximates a packet switched network for HF radioteletype message traffic. It allows the COMMSTA to transmit data packets that receipt is automatically acknowledged for by the ship board receiver. This system allows for less time being involved to establish the ship-to-shore communications link.

The air-to-ground radioteletype circuits are the communication links from the COMMSTAs/RADSTAs to Coast Guard aircraft. Communication with aircraft is important for relaying information during law enforcement or search and rescue missions, as well keeping the air station informed on the aircraft's status and safety.

D. TECHNICAL CONSIDERATIONS

The technical functions performed at each COMMSTA include antenna control, transmitter control, receiver control, radio frequency (RF) signal distribution, audio signal distribution, voice patching, message switching and routing, circuit quality control, circuit restoration, and cryptographic circuit rekeying. In a technological sense, all these functions can be performed at a remote location away from the actual equipment site. The antenna, transmitter, and receiver control are included in a project called the COMMSTA Control System, which is being installed at Coast Guard COMMSTAs [Ref. 3: p. 2].

The functions of radio frequency (RF) signal distribution, audio signal distribution, and voice patching are all subsets of antenna, transmitter, and receiver control. These are performed by the operator when required.

The message switching and routing function is being automated so that the manual transfer of traffic via paper or magnetic tape within the COMMSTA will be eliminated. A commercial microprocessor store-and-forward message switch has been implemented to automate message handling between the land line, shore-based networks, and the ship-to-shore radioteletype circuits.

III. THE STAFFING STANDARD

A. OVERVIEW

This chapter is devoted to establishing the guidelines for determining the Radiomen staffing level at a Coast Guard COMMSTA. The majority of information comes from the U.S. Coast Guard Technician Force Job Analysis and Manpower Utilization Study that was conducted in 1990 by CAE-Link Corporation [Ref. 2: p. 1]. The new RM staffing standard was drafted using the Radiomen (RM) Staffing Statistics Report from the study. Concentration will be on the shore-based radiomen standard. The methods, terms and definitions of the report, as well as those of the new draft staffing standard, will be used when determining the level of RM staffing allowed at each of the PACAREA COMMSTA facilities and for the proposed combined operation facility.

B. THE RM STAFFING STUDY

Staffing standards are the formulas used to determine the number of personnel assigned to a unit to perform mission functions and tasks. They ensure that the distribution of personnel is fair, effective and fulfills operational and support requirements.

To develop a new RM staffing standard, a study was conducted in 1990 by CAE-Link Corporation, under contract to the Office of Personnel Management, as a

part of the U.S. Coast Guard Technician Force Job Analysis and Manpower Utilization Study. The statistics report from that study was the result of collecting data from many Coast Guard units where Radiomen are assigned. The units were then categorized by the type of communications functions performed. One category of units observed was the shore-based station. This included Groups (Bases, Support Centers, Air Stations, etc.), Communications Centers (Headquarters, Area and District COMMCENS), and Communication Stations (including Communication Area Master Stations). The data collected were used in determining the staffing standard for shore-based RMs, including some unique requirements for COMMSTAs. The method of data collection was either direct observation of watchstanders or a daily log of activity reported by non-watchstanding RMs.

1. The Workload Model

An important change in the methodology of analysis of the data and the development of the staffing standard in this study was the use of the workload model instead of the previously accepted "watch position" model. In the past, units based their RM staffing levels on the number of watch positions they needed to fill to support their missions. Now the primary factor in determining staffing is unit workload based on the number of messages processed for the various circuits required at the COMMSTA. The standards use processing times, observed and clocked by stopwatch during the study, for various types of message traffic and other direct work activities. These times were developed into coefficients by CAE-Link personnel. The coefficients are multiplied by the workload of the appropriate work activity and that

forms the basis for that activity's Aggregate Functional Full-Time Equivalent (AFFTE).

2. Aggregate Functional Full-Time Equivalent

The Aggregate Functional Full-Time Equivalent (AFFTE) describes the multi-functional role a Radioman performs in the course of completing mission related tasks [Ref. 2: p. 1-1]. It is the number of billets needed to perform the work associated with a continuous communications watch position and represents the total time available to perform that work [Ref. 4: p. 1]. One AFFTE is determined to be equal to 4.46 billets [Ref. 4: p. 3]. If a unit workload is less than one AFFTE, the unit will be staffed as if it were one full AFFTE. If, on the other hand, the workload is greater than one AFFTE, the unit will be staffed proportional to the workload by multiplying 4.46 by the workload and rounding the result to a whole number of billets.

3. Workload Categories

The workload of Radiomen at shore-based units was divided into four categories: primary work, direct work, indirect work, and alert time.

a. Primary Work

The primary work is the work specific to communications such as teletype and radioteletype message processing, search and rescue voice communications, etc. [Ref. 4: p. 2]. Primary workload coefficients are used in determining the AFFTE requirements for a unit and thus determining the staffing level.

b. Direct Work

Direct work is defined as any work performed that directly affects the functions of the primary work. Examples of direct work are loading paper tape into teletypes, rekeying cryptographic equipment, answering the telephone, and following up on messages.

c. Indirect Work

Indirect work is all other work necessary for the unit to function but is not RM-specific. Included in indirect work is the maintenance, supply, and inventory tasks that are usually performed by the radiomen when personnel of appropriate ratings are not available to perform the tasks.

d. Alert Time

The time when an RM is actively monitoring a circuit and is ready to respond immediately is called alert time. This time is important and necessary to successful watchstanding because of the uneven traffic flow throughout each hour and the necessity to respond to high precedence or emergency communications. The variations in alert time between different watch positions is based on the unpredictability of traffic flow and the requirement for immediate response. Alert time plays an important role when exploring the idea of combining watch positions. "All alert time allocations are based on direct observation of RMs, industrial guidelines, and USCG expert panel review" [Ref. 4: p. 2].

4. Peak Period

The peak workload period for Coast Guard communications is the four months of summer, June through September of any calendar year [Ref. 4: p. 3]. This is generally assumed to be the case throughout the Coast Guard because of the increase in public boating activity in the summer months. This means that the standards and RM staffing levels are established based on the busiest 2,928 hours of the year.

5. Radioman In Charge

The total Radiomen billet requirements for all shore-based units maintaining a 24-hour communications watch schedule equals the number of watchstander billets plus one. This is because there is a requirement for one non-watchstanding RM called the Radioman-in-Charge [Ref. 4: p. 3].

6. Grade Distribution

Grade distribution for RMs is determined from the pyramid rating structure chart developed for each unit type [Ref. 4: p. 3]. It is the number of billets for each RM rank, Third Class RM (RM3) through Master Chief RM (RMCM), based on the total number of RM billets allowed at the unit. Although important for staffing a particular facility, it is not an important part of this thesis. The total number of RMs needed to fully staff each facility will be adequate for comparison.

C. THE COMMSTA STAFFING STANDARD

The COMMSTA standard is complex in that there are many positions where the varied communications functions are being performed. Each of these positions has an alert time associated with the type of work performed at that position. COMMSTAs also have certain functions mandated for them to perform like the 500 KHZ CW Distress Guard circuit required by Congress to be manned continuously without any collateral workload, and Coast Guard Headquarters requirement of a 24-hour manned watch for the voice air-to-ground communications circuits. Requirements like this force some positions to remain apart from others and not allow workload combination.

1. Primary Work

The primary work performed at COMMSTAs was classified into 19 separate workload factors. The average time spent on primary workload factor tasks, observed during the study, was 27.75 minutes per hour. Following is a list of the factors along with the workload coefficients for each. The coefficients are the fraction of an hour it takes to perform one element of the corresponding workload factor:

- Incoming message: 0.021 hours.
- Outgoing message: 0.066 hours.
- Secure RATT broadcast: 0.035 hours.
- SITOR broadcast: 0.053 hours.
- CW broadcast: 0.069 hours.
- FAX broadcast: 0.164 hours.

- Navy HF CW broadcast: 0.043 hours.
- NAVTEX broadcast: 0.047 hours.
- Voice broadcast: 0.127 hours.
- SITOR message: 0.067 hours.
- Secure/Non-Secure RATT message: 0.084 hours.
- High Frequency Data Link (HFDL): 0.061 hours.
- Phone Patch: 0.181 hours.
- CW AMVER/OBS: 0.076 hours.
- CW SAR: 0.061 hours.
- Voice SAR case: 0.390 hours.
- Air-to-Ground: Full-time position.
- 500 KHZ CW: Full-time position.
- Voice Distress: Full-time position.

2. Direct Work

As described previously, direct work is the work performed to directly support teletype communications message processing. The time associated with all direct work functions at a COMMSTA averaged 10.29 minutes per hour.

3. Indirect Work

For COMMSTAs, the average time associated with all indirect work functions is 5.07 minutes per hour.

4. Alert Time

There are three alert time specifications at a COMMSTA: 7.4 minutes per hour, 13.4 minutes per hour, and 28.4 minutes per hour. The alert time depends on the conditions of the three watch position types which are respectively classified as production processing, on-call response, and high vigilance. This means that 28.4 minutes per hour is the average time an operator spends monitoring his/her circuits at a position that requires high vigilance.

5. Primary Work Availability Time

A primary work availability time was computed for each of the primary workload factors. This is the time available throughout the summer period for performing the primary work functions. The primary work factor message count, or workload, for the summer period is divided by the primary work availability time in the final step, determining the AFFTE for that work factor. The primary work availability times associated with each of the three alert types are:

- Production Processing : 1,652.37 hours.
- On-Call Response : 1,464.00 hours.
- High Vigilance Response : 992.59 hours.

6. Air-To-Ground And 500 KHZ CW Distress

The mandated requirements for the air-to-ground and 500 KHZ CW distress positions, as described above, translate to one AFFTE required for each

position. These positions are full time, dedicated positions and require a full AFFTE to maintain the 24-hour watch schedule.

7. Combining Positions

Because a COMMSTA has such a variety of work to perform, the positions that require only fractions of an AFFTE may be combined to more effectively use personnel. The equipment configuration may prevent optimal combinations, but efforts should be made to combine positions wherever possible. There are four considerations to be made when combining watch positions.

a. Primary Workload

The AFFTE cannot be greater than 1.00 for the primary workload when added together. The only exception may be for small fractions over 1.00 AFFTE where a watch supervisor may assist occasionally to clear backlogs. This method of combination can only be used for production processing functions.

b. Compatibility of Alert Time Requirements

Positions with the same alert time requirements can be combined. If positions with differing alert time requirements are combined, the alert time used when determining the staffing level of the combined position is the dominant (largest) alert time requirement of the two.

c. Physical and Operational Compatibility of Equipment

In the decision to combine positions, human factors, equipment layout, space available, and noise levels must be considered.

d. Legal and Policy Considerations

Any combination of the positions at a COMMSTA must be in accordance with all Federal laws and Coast Guard communications directives and policies.

8. Supervisory And Technical Controller AFFTE

COMMSTAs have large watch organizations with a number of functions to perform. Because of this, the staffing standard states that all COMMSTAs will be assigned 1.00 AFFTE for a Watch Supervisor.

The Communications Area Master Stations (CAMS) are responsible for the communication system including other COMMSTAs. CAMSPAC is assigned an additional supervisory AFFTE defined as the Communications Watch Officer (CWO).

Only CAMS (Atlantic and Pacific) and COMMSTA Kodiak were observed to have Technical Control personnel. Known as Tech Controllers, their jobs include circuit patching, quality control of circuits and equipment, and determining causes of circuit problems. No determination was made whether or not they were needed at any other functioning COMMSTA, but both CAMSPAC and COMMSTA Kodiak are assigned a 0.65 AFFTE for Tech Controller functions because they were observed at those locations [Ref. 2 : p. 4-44].

9. Staffing Calculation

This section describes the actual calculation process for determining the Radioman staffing level for a communication station. A recommended billet level for a facility will result by following this process.

a. Message Count

To begin calculating the RM staffing level for a communication station, the workload must be measured by recording a message count for each of the primary workload factors performed at that facility. The period used for the count is 24 hours per day during the peak period of the summer, defined as the first of June through the 30th of September.

There are four rules to follow when counting message traffic. These guidelines are used to ensure consistent traffic counts are made at all units:

- Counting the same message twice is not allowed. An example would be if a message was sent to two or more recipients at the same time over the same circuit, it would be only counted once.
- Only teletype messages are counted. If a message is received over the counter and sent out by teletype, it is only counted once.
- A message sent over two different circuits is counted as two messages.
- A message that is processed twice (e.g., transmitted twice because of an error or non receipt) is counted as two messages.

b. The Billet Level Calculation

Once the message count has been collected, the number of billets that is justified by the workload can be determined. Following the below listed procedure will determine the staffing level for a COMMSTA:

- Calculate watchstander AFFTE by using the work sheet provided by the standard. Multiply the unit count by the coefficient of that workload factor to determine unit work. Then divide unit work by the primary workload availability time to determine the fraction of AFFTE for that factor. The sum of these fractions is the total unit watchstander AFFTE.
- Combine watch positions by examining which functions can be combined. This step is done at the unit based on the criteria stated earlier in the chapter. The remaining calculations can be done using the non-combined AFFTE total determined in the previous step.
- Increase the total AFFTE for watch supervisor by adding 1.00 AFFTE to the total. This is authorized for all COMMSTAs.
- Determine whether a CAMS Communications Watch Officer is authorized. For CAMS facilities only, add 1.00 AFFTE to the total.
- Determine Tech Control AFFTE. Add 0.65 AFFTE for CAMS Atlantic or Pacific or COMMSTA Kodiak.
- Determine total number AFFTE by adding the AFFTE from watch positions, watch supervisor, CAMS CWO, and tech control.
- Determine total number of unit RM billets by multiplying the total AFFTE by 4.46 billets per AFFTE and round to the nearest whole number.
- Add Radioman-in-Charge billet to the total billets determined by AFFTE.
- Determine grade distribution from the chart provided in the staffing standard.

The total billet calculations using this standard will be used to compare the staffing of the four PACAREA facilities to the proposed consolidated facility.

IV. THE PACAREA COMMSTAS

A. OVERVIEW

The four COMMSTAs of the PACAREA communication system are separated across the Pacific Ocean to provide communication coverage of the area. Their missions are similar, with their current Radioman staffing level commensurate with the number of mission areas they support. This is because billet levels at a facility have previously been based on the need to fill watch positions and the new staffing standard based on the staffing study has not been implemented.

The four major sections of this chapter correspond to the four communications facilities. Each section has a brief description of the facility, specifying its current RM billet authorization, a list of each of the mission area functions supported by the specific facility, a brief account of how the facility manages the work load of a watch, and the results of RM staffing level computations based on the new RM Staffing Standard and using the unit's message count statistics from the summer of calendar year 1990.

B. CAMSPAC

The Communications Area Master Station is located in Pt. Reyes, California, approximately 50 miles northwest of San Francisco. Current billet authorization for

CAMSPAC is 46 Radiomen. The mission functions that are performed at CAMSPAC are:

- Incoming message.
- Outgoing message.
- Secure RATT broadcast.
- SITOR broadcast.
- CW broadcast.
- FAX broadcast.
- Navy HF CW broadcast.
- NAVTEX broadcast.
- Voice broadcast.
- SITOR message.
- Secure/Non-Secure RATT message.
- High Frequency Data Link (HFDL).
- Phone Patch.
- CW AMVER/OBS.
- CW SAR.
- Voice distress.
- Air-to-Ground.
- 500 KHZ CW.

1. CAMSPAC Watch Positions

The above listed communications functions are performed within 13 operating positions at CAMSPAC. Obviously, some of the functions are combined to create a full time working position. Which functions are combined is determined by the Commanding Officer of the COMMSTA and the configuration of the communications equipment. Two of the 13 positions are supervisory and one other is a spare. Below is a watch position breakdown, with a brief description of the functions performed in that position.

a. 500 KHZ Distress

This is the 24 hour guard maintained by law on the 500 KHZ frequency. The operator answers calls on the distress frequency and shifts to standard working frequencies to handle non-distress traffic. There are three areas guarded by this position: San Francisco, California; Long Beach, California; and Astoria, Oregon. The operator is also responsible for six daily weather Notice to Mariners CW broadcasts as well as 12 NAVTEX broadcasts. [Ref. 5]

b. CW Training and MF Distress Backup

This position is identical in configuration to the 500 KHZ MF distress position because of the need to work current distress calls and also to give new operators the opportunity to become proficient at Morse Code. [Ref. 5]

c. *HF CW Ship/Shore*

This position is the 24 hour guard of 6 MHZ, 8 MHZ, and 16 MHZ for distress and medical emergencies. The operator also receives AMVER messages and weather observations. [Ref. 5]

d. *HF Ship/Shore Secure Radioteletype*

Manned 24 hours a day, this position is on call to take message traffic from any Coast Guard, Navy or other government agency vessel on the secure RATT circuit which manually connects with NAVCOMPARS. The operator also guards two voice networks, System Coordination Network (SCN) and Secure Voice Network (SVN), using multiple frequencies. [Ref. 5]

e. *HF Ship/Shore Secure RATT Broadcast*

The operator in this position manually keys a single channel encrypted broadcast on protected high frequency radioteletype (CRTT broadcast). The broadcast is copied by any Coast Guard or Navy vessel receiving message traffic this way. The operator also guards two voice networks, System Coordination Network (SCN) and Secure Voice Network (SVN). This position is manned 24 hours a day. [Ref. 5]

f. *High Frequency Data Link (HFDL)*

This position has replaced the unencrypted radioteletype position of the past. Presently not manned full time, the position is only used upon request from Coast Guard vessels equipped to handle HFDL traffic. [Ref. 5]

g. *Air-to-Ground and MF Distress on 2182 KHZ*

This position is staffed 24 hours a day for providing voice communications as required for fixed wing and rotary wing Coast Guard aircraft as well as maintaining the required guard on the maritime distress frequency, 2182 KHZ. Medical emergencies and other distress calls are the major responsibility of this position. [Ref. 5]

h. *Broadcast*

This position is responsible for 36 broadcasts in each 24 hour period. The broadcasts include SITOR, HF CW, NAVTEX, National Weather Service FAX, MF voice, HF voice, and MF CW. The operator also handles traffic for National Oceanic and Atmospheric Administration (NOAA) vessels on two SITOR circuits, interfacing into the NAVCOMFARS. [Ref. 5]

i. *Land Lines*

The land line operator sends, receives, and prepares message traffic on the NAVCOMPARS circuit, ODIN circuit, the Secure Data Network, and the weather circuits. This operator also helps prepare the CRTT broadcast with the ship/shore secure RATT operator. [Ref. 5]

j. *Technical Control*

A technical controller watchstander is available to the communications watch for handling equipment problems. He/she is responsible for monitoring the quality of all circuits, assigning transmitters and cryptographic equipment to positions,

and coordinating communication circuits between the transmitter and receiver facilities. [Ref. 5]

k. Supervisory Positions

The supervisory positions of a watch are the Communications Watch Officer (CWO) and the Watch Supervisor [Ref. 5].

2. CAMSPAC Staffing Calculation

To determine the staffing level based on the new RM staffing standard, a message count for a four month period was needed. The first of June through the 30th of September 1990 was chosen because it is the most recent full summer period. The message counting guidelines described in the previous chapter were followed to ensure consistent counting from each COMMSTA. Appendix A shows the tabulation of total primary work AFFTE for watchstanders at CAMSPAC of 8.064. Adding a full AFFTE for both the watch supervisory position and the CWO requirement at a CAMS. and adding the 0.65 AFFTE for the Tech Control authorization, brings the total unit AFFTE to 10.714. Multiplying by 4.46 billets per AFFTE and rounding to 48, and then adding the RMIC billet gives a total billet authorization for CAMSPAC of 49 Radioman billets. This shows that the new standard would justify a three billet increase from the current authorization of 46 RM billets.

C. COMMSTA KODIAK

Communication Station Kodiak is located at the northeast side of Kodiak island in the Gulf of Alaska. The transmitter facility is about seven miles from the town of

Kodiak while the receiver building and antennas are approximately 14 miles further away. The RM billet authorization for COMMSTA Kodiak is 51 RMs. The mission functions that are performed at Kodiak are:

- Incoming message.
- Outgoing message.
- Secure RATT broadcast.
- SITOR broadcast.
- CW broadcast.
- FAX broadcast.
- Navy HF CW broadcast.
- NAVTEX broadcast.
- Voice broadcast.
- SITOR message.
- Secure/Non-Secure RATT message.
- High Frequency Data Link (HFDL).
- Phone Patch.
- CW AMVER/OBS.
- CW SAR.
- Air-to-Ground.
- 500 KHZ CW.
- Voice distress, MF and VHF-FM.

1. COMMSTA Kodiak Watch Positions

The above primary work functions are combined into 11 watch positions at COMMSTA Kodiak. The following is a brief description of these positions.

Although the separate functions may be similar to the ones performed at CAMSPAC, of note is the difference in their combinations into the watch position, again determined by the command and the equipment configuration.

a. 500 KHZ Distress

This position is the mandatory guard for CW distress. The operator maintains the 500 KHZ guard in two locations; Kodiak and remotely from Adak, AK. The four CW broadcasts are also keyed and monitored from this position. [Ref. 6]

b. CW Working

The operator at this position receives AMVER reports, weather observation reports, foreign fisheries reports, and other government message traffic. He also monitors the four NAVTEX broadcasts daily as well as receives distress traffic on the 8364 KHZ International Life Boat Beacon frequency. [Ref. 6]

c. Ship-to-Shore Secure Radioteletype

Responsible for one send teletype and two receive teletypes, the operator in this position maintains the secure radioteletype communications between COMMSTA Kodiak and ships on its guard list. He also generates and keys the secure broadcast as well as guards the ship-to-shore secure voice network (SVN). [Ref. 6]

d. Ship-to-Shore Unclassified Radioteletype

The unclassified message traffic between Kodiak and the vessels on their guard list who do not use encryption devices is handled at this position, including an unclassified radioteletype broadcast. This operator guards the System Coordination Network (SCN) frequencies. [Ref. 6]

At times when message traffic has slowed or few ships are on the guard list, only one operator is assigned to work both the secure and unclassified radioteletype positions. This combination of functions is often more than one person can handle, with a backlog of more than 20 messages building in the unclassified position. Combining these two positions also invites security problems with one operator working both sides of the classified/unclassified barrier. [Ref. 6]

e. Air-to-Ground

This position guards three air-to-ground frequencies as well as the Secure Air-to-Ground voice network. All Coast Guard aircraft within the COMMSTA's area of responsibility are guarded by Kodiak. [Ref. 6]

f. HF Voice Distress

The operator in this position guards the voice frequencies of 2182 KHZ and 4125 KHZ. All voice broadcasts are made from this position. The operator also monitors the operation of the Search and Rescue Satellite (SARSAT) local user terminal located at Kodiak. [Ref. 6]

g. Land Lines

This is the position where all message traffic sent or received via land line is processed. The operator handles messages over AUTODIN, MTDS, the Coast Guard's Seventeenth District Network, and two local Kodiak island networks. The operator generates the unclassified radioteletype broadcast and the CW broadcasts, also. Because few ships in Kodiak's area are equipped with HF DL, the land line operator also operates the HF DL system at the COMMSTA. [Ref. 6]

h. Air Station Kodiak Communication Center

Communication Stations do not normally operate an over-the-counter message service or a VHF-FM distress network. Both of these functions are typically performed at a Coast Guard Group unit. COMMSTA Kodiak has been assigned these functions for the western Alaskan area by the Coast Guard's Seventeenth District Commander. The communication center, located in a Kodiak Air Station hangar, is where one operator maintains the watch and remotely operates eight VHF-FM high level sites that are in various locations on the Alaskan peninsula and Aleutian Islands. The operator also processes message traffic for Kodiak area Coast Guard commands, providing over-the-counter service for classified and encrypted for transmission only (EFTO) traffic, as well as an electronic mail service to the commands for all other traffic. [Ref. 6]

i. Technical Control

A technical controller does not currently stand a watch at Kodiak, but is available to the communications watch for handling equipment problems. He is responsible for monitoring the quality of all circuits, assigning transmitters and crypto equipment to positions, and coordinating communication circuits between the transmitter and receiver facilities. [Ref. 6]

j. Supervisory Positions

COMMSTA Kodiak has a Watch Supervisor position and a Communications Watch Officer (CWO) [Ref. 6].

2. COMMSTA Kodiak Staffing Calculation

To determine the staffing level for COMMSTA Kodiak based on the new RM staffing standard, a message count from the first of June through the 30th of September 1990 was used. The message counting guidelines described in the previous chapter were followed to ensure consistent counting from each COMMSTA.

Appendix B shows the computations leading to a primary work AFFTE for watchstanders at COMMSTA Kodiak of 7.276. Adding a full AFFTE for the watch supervisory position and adding the 0.65 AFFTE for the Tech Control authorization brings the total unit AFFTE to 8.926. Multiplying by 4.46 billets per AFFTE and rounding to 40, and then adding the RMIC billet, gives a total billet authorization for COMMSTA Kodiak of 41 Radioman billets. The current authorization of 51 RM billets would have to be decreased by 10 billets to match the calculated level.

D. COMMSTA HONOLULU

The Communication Station in Hawaii is located on the island of Oahu, next to the town of Wahiawa. The billet authorization to support operations is currently 32 Radiomen. The mission functions that are performed at Honolulu are:

- Incoming message.
- Outgoing message.
- Secure RATT broadcast.
- SITOR broadcast.
- CW broadcast.
- FAX broadcast.
- Navy HF CW broadcast.
- NAVTEX broadcast.
- Voice broadcast.
- SITOR message.
- Secure/Non-Secure RATT message.
- High Frequency Data Link (HFDL).
- Phone Patch.
- CW AMVER/OBS.
- CW SAR.
- Air-to-Ground.
- 500 KHZ CW.

1. COMMSTA Honolulu Watch Positions

The above primary work functions are combined into seven watch positions at COMMSTA Honolulu that are briefly described below. Although the separate functions may be similar to the ones performed at CAMSPAC and COMMSTA Kodiak, COMMSTA Honolulu combined them differently into their watch positions.

a. 500 KHZ Distress and HF Continuous Wave

This position is manned 24 hours and guards the 500 KHZ distress frequency. The operator also monitors four NAVTEX broadcasts a day as well as two MF CW broadcasts. An additional requirement of this position is to work the 22 MHZ HF CW circuit for weather observation reporting and AMVER reports. [Ref. 7]

b. HF Continuous Wave and 8364 KHZ

The operator at this position also receives AMVER and weather observation reports via HF CW like the first position described above, but on eight and 12 MHZ frequencies. Additionally, the operator maintains a continuous guard of 8364 KHZ, the International Life Boat calling frequency. [Ref. 7]

c. Air-to-Ground

The air-to-ground position at COMMSTA Honolulu has one operator that provides air-to-ground communications, secure and non-secure, for Coast Guard aircraft. This position also aids the ship-to-shore radioteletype operator when the unclassified traffic load is backlogged. The operator at this position helps out in many

other areas, e.g., phone watch when the CWO is busy or typing messages for the land line operator. [Ref. 7]

d. Broadcast

The broadcast position operator makes, keys, and monitors nine SITOR broadcasts a day along with 13 HF CW broadcasts. Three SITOR frequencies are guarded at this position, and it is also used for SAR case guard. This position is usually manned by the land line operator because of watch section size. [Ref. 7]

e. Ship-to-Shore Radioteletype and Voice

The operator of this position guards SCN and SVN frequencies and is on call for secure and non-secure radioteletype, HF DL and voice traffic. Four HF voice broadcasts are made daily from this position, and the operator can also perform SAR voice communications. [Ref. 7]

f. Supervisor and Land Lines

Along with Watch Supervisor responsibilities of standing by for the other operators for personal breaks as well as the rotation of the watch, this operator performs all the land line operations of formatting and transferring traffic from MTDS, NAVCOMPARS and other circuits. [Ref. 7]

g. Communications Watch Officer (CWO)

The CWO checks, files, and counts all message traffic. He acts as the Officer of the Day representing the COMMSTA for the commanding officer. Security rounds of the facility are made by the CWO during his watch. The CWO also makes

all frequency changes to the transmitters and maintains the antenna matrix control.

[Ref. 7]

2. COMMSTA Honolulu Staffing Calculation

To determine the staffing level for COMMSTA Honolulu based on the new RM staffing standard, its message count from the first of June through the 30th of September 1990 was used. The message counting guidelines described in the previous chapter were again followed. Tabulated in the Appendix C are the calculations leading to a primary work AFFTE for watchstanders at COMMSTA Honolulu of 4.946. Adding the full AFFTE for the watch supervisory position brings the total unit AFFTE to 5.946 and multiplying by 4.46 billets per AFFTE gives 26.52 billets. Rounding to 27 and then adding the RMIC billet gives a total billet authorization for COMMSTA Honolulu of 28 RM billets. The current authorization of 32 Radioman billets would be decreased by four billets to match the calculated level if it were implemented.

E. RADSTA GUAM

The Coast Guard's communication facility in Guam is at the NAVCAMS Western Pacific Command Naval Base overlooking Apra Harbor. The billet authorization for RMs at the radio station is 28. The mission functions that are performed at Guam are:

- Incoming message.
- Outgoing message.

- CW broadcast.
- SITOR broadcast.
- Navy HF CW broadcast.
- NAVTEX broadcast.
- Voice broadcast.
- SITOR message.
- Secure/Non-Secure RATT message.
- High Frequency Data Link (HFDL).
- Phone Patch.
- CW AMVER/OBS.
- CW SAR.
- Air-to-Ground (as needed).
- 500 KHZ CW.
- Voice distress.

1. RADSTA Guam Watch Positions

RADSTA Guam combined the above listed primary work functions into six watch positions. The following is a brief description of these positions. Although the separate functions may be similar to the ones performed at CAMSPAC and COMMSTAs Kodiak and Honolulu, RADSTA Guam uses a different variation in defining its watch positions.

a. 500 KHZ Distress

This position maintains the guard on 500 MHZ CW as well as transmits and monitors the MF CW weather broadcasts. The operator is also responsible for AMVER and SAR traffic on HF SITOR at this position. [Ref. 8: pp. (4)-12,(4)-13]

b. HF Continuous Wave

All HF CW for AMVER, weather observation reports and SAR is handled by the operator at this position [Ref. 8: pp. (4)-12,(4)-13].

c. Air-to-Ground and Ship-to-Shore Radioteletype

Because of the limited Coast Guard aircraft and surface activity in this area, RADSTA Guam is able to combine the air-to-ground functions with the ship-to-shore radioteletype functions into one position. The operator at this position also is responsible for HF voice communications for SAR, AMVER and SCN. [Ref. 8: pp. (4)-12,(4)-13]

d. Voice Distress

This position has the responsibility for the 2182 KHZ frequency guard for search and rescue. The operator also keys the HF voice weather broadcast from this position. [Ref. 8: pp. (4)-12,(4)-13]

e. Supervisor and Land Lines

The supervisor position at RADSTA Guam is similar to that of COMMSTA Honolulu in that the functions of the land line operator are combined with the responsibility of the supervisor [Ref. 8: pp. (4)-12,(4)-13].

f. Communications Watch Officer (CWO)

RADSTA Guam has an assignment for a CWO with the same basic duties as the CWO at COMMSTA Honolulu. The CWO is responsible for the watch and the equipment such as antenna matrix control and transmitter frequency assignment. [Ref. 8: pp. (4)-12,(4)-13]

2. RADSTA Guam Staffing Calculation

To determine the staffing level for RADSTA Guam based on the new RM staffing standard, the same period for message counting as before was used. The message counting guidelines described in the previous chapter were again followed. Appendix D shows the computations leading to a primary work AFFTE for watchstanders at RADSTA Guam of 5.495. Adding the full AFFTE for the watch supervisory position brings the total unit AFFTE to 6.595. Multiplying the unit AFFTE by 4.46 billets gives 28.97 billets. Rounding this to 29 and then adding the RMIC billet gives a total billet authorization for RADSTA Guam of 30 Radioman billets. In this case, the current authorization of 28 Radioman billets would need to be increased by two billets to match the calculated level.

V. THE CONSOLIDATED FACILITY

A. COMBINING THE PRIMARY WORKLOAD FACTORS

From direct observation of the four separate PACCOMSYS communications facilities, nearly all the primary workload factors are the same. As was stated in Chapter II, all the functions performed by a Radioman can be controlled from a remote location, so combining the workload into one communications facility is conceivable.

Using the basic concept that was developed and proposed in a paper in 1986 by Chief Warrant Officer (now retired) William Moore, the consolidated facility should be located at CAMSPAC [Ref. 9]. For CAMSPAC to control the equipment at the other three facilities would be the most logical approach because CAMSPAC already performs all COMMSTA functions and maintains control over the PACCOMSYS traffic.

Of the primary workload functions performed in the PACCOMSYS facilities, only the VHF-FM distress guard maintained at COMMSTA Kodiak should not be part of the consolidated facility. This function, as already stated, is normally assigned to a Coast Guard Group Office. The Coast Guard Support Center or the Air Station on Kodiak should have the responsibility to maintain the VHF-FM guard, especially since the equipment is already located in an Air Station hangar. The workload associated with the VHF-FM distress guard is equal to one AFFTE. This would mean that one

AFFTE would remain in the Kodiak area, and not be assigned to the consolidated communications facility.

B. STAFFING FOR THE PROPOSED FACILITY

The RM staffing calculation for the proposed single operations facility of the PACAREA Communication System is really quite simple, given the list of the primary workload factors determined above. By adding the message count statistics from the four COMMSTAs/RADSTA with respect to the primary workload factors on the list, a new staffing level can be calculated and attributed to the RM staffing that would be needed if the new facility were established. To maintain consistency in determining the staffing level, a strict adherence was made to the standard calculation process.

Appendix E is the work sheet used in the calculation of the primary work AFFTE for the consolidated facility. The "non-combined" AFFTE for the proposed unit is 17.780 AFFTE. Adding a full AFFTE for both the Watch Supervisor and Communications Watch Officer and a 0.65 AFFTE for the Technical Control position, all which would be required for the running watch at the new facility, brings the AFFTE to 20.430. Multiplying the AFFTE by 4.46 billets and rounding a whole number gives 91 watchstander billets. Adding a Radioman in Charge gives a total staffing level of 92 Radiomen.

C. COMPARISON

If the calculated staffing levels of the four COMMSTA/RADSTAs were added together and compared to the calculated staffing level of the proposed consolidated

consolidated facility, the difference would be a savings of 56 billets. Since the present total billet level authorization for the COMMSTA/RADSTAs is 157 RMs, a considerable savings of 65 billets would be realized if the new facility were established. The important comparison is between the calculated totals, however.

Some of the difference between the four calculated staffing levels and the proposed facility can be numerically accounted for. The reduction in the total number of watch supervisor positions accounts for three AFFTE, or 13.38 billets. Also, 0.65 AFFTE (2.899 billets) is saved by not having a Tech Controller at Kodiak. There are two AFFTE saved by reducing the number of air-to-ground radio guard positions and two AFFTE for the HF voice distress guard positions, which calculates to another 17.84 billets. There are also three fewer AFFTE needed for the 500 KHZ CW guard. Adding these apparent savings to the one AFFTE that would remain in the Kodiak area for the VHF-FM distress guard, gives a total billet number of 52.

The difference of four billets between the original apparent savings of 56 and the number of billets that can be easily accounted for (52), leads to a search for another answer. There is no longer need for an Radioman in Charge at Kodiak, Honolulu, and Guam. This accounts for three billets. There has also been some rounding during the calculations for each of the communication stations, which accounts for the remaining billet.

D. PROPOSED WATCH POSITIONS

As a validity check to the billet numbers discussed above, a watch position structure is proposed, combining primary work functions and assigning numbers of personnel to the watch position. The fractional AFFTE for each of the primary workload factors computed in Appendix E was used in determining the number of personnel needed to staff a position. The functions combined were in accordance with the guidelines listed in Chapter III and compared to the watch positions already established at the PACCOMSYS facilities to ensure the functions can be combined.

- CWO position: One person per watch to serve as the Communications Watch Officer.
- Watch Supervisor position: One AFFTE, or one person per watch as the Watch Supervisor.
- Land Lines position: Incoming and outgoing messages combine for an AFFTE of 6.712. To process all the land line network message traffic, round the AFFTE to seven people to man this position.
- Voice position: Although voice distress is a full AFFTE, combining resources with the voice SAR case workload and the voice broadcast gives an AFFTE of 1.77. This position can be manned by two people per watch.
- 500 KHZ CW position: One person position manned 24-hours a day.
- Air-to-ground position: One person position taking care of Coast Guard air-to-ground communications.
- CW working position: Combining the work factors of CW AMVER/OBS and CW SAR will create a three man position.
- RATT position: Three people are needed to man this position because of a combined workload AFFTE of 2.941. This position will handle the RATT message traffic and the secure RATT broadcast.

- Miscellaneous radio services position: With as combined AFFTE of 0.8138, this position would be manned by one person per watch. The traffic processed at this position would be SITOR broadcasts and SITOR messages, as well as HFDL messages and phone patches.
- Broadcast position: This position would be responsible for the FAX, NAVTEX, CW and Navy CW broadcasts. This would also be an one person position.

These ten watch positions, if fully manned as proposed, translate to four watch sections of 21 RMs per watch for a total of 84 RMs. If there were two RMs added to each watch section to account for leave and transfer, that would be a total of 92 RMs. Remember that 92 billets is the total staffing level calculated by the standard. Since the one billet for the Radioman in Charge is the only one not added in to the total, an obvious breakdown of watch sections would be to have three at 23 RMs and one with 22 RMs. This watch position model appears consistent with the established guidelines and matches the number of billets calculated for the consolidated facility by the new staffing standard.

VI. SUMMARY

A. ANALYSIS

The four PACCOMSYS communications facilities have a total billet authorization of 157. Using the message traffic count from the summer of 1990 and computing the staffing level using the new staffing standard, a total of 148 billets would be authorized. The computations for the proposed combined communications facility concluded that it would only take 92 billets to staff a facility that would perform the functions of the PACCOMSYS. Nearly all the billet savings stem from having fewer supervisory positions and a reduction in the number of locations where mandatory communication guard positions are maintained. The fact that there is a reduction in these billets may not be acceptable, however, and consideration must be given to this if the new facility were established.

The previous chapter concluded that the proposed facility would be possible with 92 billets. An assumption made, but not fully explained, is that the message count determined for the consolidated facility is the same as the total messages from each of the separate facilities. The key to the staffing standard is the message count establishing the workload for the COMMSTA. In this study, an assumption was made that the messages handled at one COMMSTA were different than the messages counted at another. It is very possible that the land line message count will be reduced in a combined facility. Comparing messages counted at two communication

facilities when they are received via land lines will reveal this. An example would be the many general messages sent from Coast Guard Headquarters as ALCOGARD (message addressed to all Coast Guard units). These messages would be counted once at the consolidated facility, where presently the message is counted once at each of the four COMMSTA/RADSTAs, for a collective count of four.

The combination of the four lists of primary work factors also assumed that only one person would be needed for the mandatory positions of air-to-ground, 500 KHZ CW, and HF Voice Distress. There is no count of message traffic recorded that could be used to determine if more than one person would be needed when covering a large geographic area like the Pacific Ocean.

It seems, from the above discussion, that it would be difficult to determine to extraordinary accuracy the workload of a new facility. The staffing level first authorized for a new facility would be only as accurate as the workload numbers used to determine it.

B. CONCLUSION

The staffing level for the proposed, consolidated, communications facility for the PACCOMSYS would reduce the number of Radiomen needed to staff the communications systems in the Coast Guard's Pacific Area. The total reduction, however, depends on the workload that the consolidated facility must process. This thesis has estimated the workload and subsequent staffing level, but there are factors such as the air-to-ground and voice distress functions which may require more RMs

to adequately staff the new facility. Conversely, the message count for land line messages could be exaggerated, leading to a further reduction in staffing if the workload were not as large as first indicated.

C. FURTHER STUDY

There are two areas that invite further study. First, a more specific message count procedure could be used to better approximate the workload projected for the new facility. Comparing the messages handled at the four COMMSTA/RADSTAs and determining redundancy in the count would verify a correct message count to use in the staffing calculations. This could either lead to a new result in staffing levels or validate the methods of this thesis and verify the staffing level stated here.

Another area of study could be the furtherance of what this thesis started. An engineering model could be developed to satisfy the requirements of a new, consolidated communications facility. In the process of modeling the new facility, a summary of costs could be combined with the costs savings from a reduction in billets and a cost/benefit study made. A study of these costs could help determine if the Coast Guard should consider consolidating communications operations from the four COMMSTAs to one facility. These additional costs include:

- Capital costs of installing new transmitters and receivers capable of remote operation.
- Costs of land line connectivity to the remote sites or the use of other options such as leasing satellite channels.

- The capital cost of a new operations building and equipment for the larger consolidated site.

Beyond these two study areas is the fact that the communications field is changing fast. A significant change in the technology used in message processing will change the time it takes to perform a function. When that happens, the statistics collected by CAE-Link in the staffing study will no longer be useful. The methods used in the staffing standard are still valid but the coefficients used to determine the primary workload AFFTE for that factor will be changed. This is because it will be possible to process more messages during the RMs available time at his/her position.

Additionally, by the time this thesis was completed, the staffing study results will already have been modified. Because of additional information submitted to Coast Guard Headquarters by the COMMSTAs, all COMMSTAs will be authorized a CWO position in their watch sections [Ref. 10].

To maintain adequate staffing levels at Coast Guard COMMSTAs, it appears that a continuing effort must be made by the Coast Guard to maintain a close watch on the procedures used in processing message traffic. Any changes in technology used or changes in the workload at COMMSTAs will have an effect on the ability of the assigned staffing level to meet the communication needs of the area.

APPENDIX A

TOTAL WORK AFFTE - CAMSPAC San Francisco, CA

Primary <u>Workload Factor</u>	Unit <u>Count</u>	<u>Value</u>	Average <u>Workload</u>	Primary Message Process Time <u>Available</u>	<u>AFFTE</u>
Incoming message	45,117	0.021 hrs	947.46 hrs	1652.37 hrs	0.573
Outgoing message	30,626	0.066 hrs	2,021.32 hrs	1652.37 hrs	1.223
Sec.RATT broadcast	18,191	0.035 hrs	636.69 hrs	1652.37 hrs	0.385
SITOR broadcast	976	0.035 hrs	34.16 hrs	1652.37 hrs	0.021
CW broadcast	4,416	0.069 hrs	304.70 hrs	1652.37 hrs	0.184
FAX broadcast	4,295	0.164 hrs	704.38 hrs	1652.37 hrs	0.426
Navy HF CW bcst	0	0.043 hrs	0.00 hrs	1652.37 hrs	0.000
NAVTEX broadcast	1,339	0.047 hrs	62.93 hrs	1652.37 hrs	0.038
Voice broadcast	2,496	0.127 hrs	316.99 hrs	1652.37 hrs	0.192
SITOR message	1,270	0.067 hrs	85.09 hrs	1652.37 hrs	0.052
RATT message	19,258	0.084 hrs	1,617.67 hrs	1464.00 hrs	1.105
HFDL message	78	0.061 hrs	4.76 hrs	1464.00 hrs	0.003
Phone Patch	67	0.181 hrs	12.13 hrs	1464.00 hrs	0.008
CW AMV/OBS	10,635	0.076 hrs	808.26 hrs	992.80 hrs	0.814
CW SAR	177	0.061 hrs	10.80 hrs	992.80 hrs	0.011
Voice SAR case	74	0.390 hrs	28.86 hrs	992.80 hrs	0.029
Air-to-Ground	Guard	N/A	N/A	N/A	1.000
500 KHZ CW	Guard	N/A	N/A	N/A	1.000
Voice Distress	Guard	N/A	N/A	N/A	1.000
TOTAL watchstander "non-combined" AFFTE				8.064	

APPENDIX B

TOTAL WORK AFFTE - COMMSTA Kodiak, AK

<u>Primary Workload Factor</u>	<u>Unit Count</u>	<u>Value</u>	<u>Primary Message</u>		<u>AFFTE</u>
			<u>Average Workload</u>	<u>Process Time Available</u>	
Incoming message	40,674	0.021 hrs	854.15 hrs	1652.37 hrs	0.517
Outgoing message	26,582	0.066 hrs	1,754.41 hrs	1652.37 hrs	1.062
Sec.RATT broadcast	5,945	0.035 hrs	208.08 hrs	1652.37 hrs	0.126
SITOR broadcast	0	0.035 hrs	0.00 hrs	1652.37 hrs	0.000
CW broadcast	1,782	0.069 hrs	122.96 hrs	1652.37 hrs	0.074
FAX broadcast	246	0.164 hrs	40.34 hrs	1652.37 hrs	0.024
Navy HF CW best	0	0.043 hrs	0.00 hrs	1652.37 hrs	0.000
NAVTEX broadcast	3,209	0.047 hrs	150.82 hrs	1652.37 hrs	0.091
Voice broadcast	3,476	0.127 hrs	441.45 hrs	1652.37 hrs	0.267
SITOR message	0	0.067 hrs	0.00 hrs	1652.37 hrs	0.000
RATT message	14,692	0.084 hrs	1,234.13 hrs	1464.00 hrs	0.843
HFDL message	441	0.061 hrs	26.91 hrs	1464.00 hrs	0.018
Phone Patch	109	0.181 hrs	19.73 hrs	1464.00 hrs	0.014
CW AMV/OBS	1,881	0.076 hrs	142.96 hrs	992.80 hrs	0.144
CW SAR	36	0.061 hrs	2.20 hrs	992.80 hrs	0.002
Voice SAR case	239	0.390 hrs	93.21 hrs	992.80 hrs	0.094
Air-to-Ground	Guard	N/A	N/A	N/A	1.000
500 KHZ CW	Guard	N/A	N/A	N/A	1.000
Voice Distress HF	Guard	N/A	N/A	N/A	1.000
Voice Distress VHF	Guard	N/A	N/A	N/A	1.000

TOTAL watchstander "non-combined" AFFTE **7.276**

APPENDIX C

TOTAL WORK AFFTE - COMMSTA Honolulu, HI

Primary Workload Factor	Unit Count	Value	Average Workload	Primary Message Process Time Available	AFFTE
Incoming message	30,916	0.021 hrs	649.24 hrs	1652.37 hrs	0.393
Outgoing message	26,359	0.066 hrs	1,739.69 hrs	1652.37 hrs	1.053
Sec.RATT broadcast	0	0.035 hrs	0.00 hrs	1652.37 hrs	0.000
SITOR broadcast	1,080	0.035 hrs	37.80 hrs	1652.37 hrs	0.023
CW broadcast	421	0.069 hrs	29.05 hrs	1652.37 hrs	0.018
FAX broadcast	0	0.164 hrs	0.00 hrs	1652.37 hrs	0.000
Navy HF CW bcst	1,560	0.043 hrs	67.08 hrs	1652.37 hrs	0.041
NAVTEX broadcast	661	0.047 hrs	31.07 hrs	1652.37 hrs	0.019
Voice broadcast	480	0.127 hrs	60.96 hrs	1652.37 hrs	0.037
SITOR message	609	0.067 hrs	40.80 hrs	1652.37 hrs	0.025
RATT message	6,152	0.084 hrs	516.77 hrs	1464.00 hrs	0.353
HFDL message	2,542	0.061 hrs	155.06 hrs	1464.00 hrs	0.106
Phone Patch	146	0.181 hrs	26.43 hrs	1464.00 hrs	0.018
CW AMV/OBS	10,213	0.076 hrs	776.19 hrs	992.80 hrs	0.782
CW SAR	45	0.061 hrs	2.75 hrs	992.80 hrs	0.003
Voice SAR case	190	0.390 hrs	74.10 hrs	992.80 hrs	0.075
Air-to-Ground	Guard	N/A	N/A	N/A	1.000
500 CW KHZ	Guard	N/A	N/A	N/A	1.000
Voice Distress	N/A	N/A	N/A	N/A	0.000

TOTAL watchstander "non-combined" AFFTE **4.946**

APPENDIX D

TOTAL WORK AFFTE - COMMSTA Guam

<u>Primary Workload Factor</u>	<u>Unit Count</u>	<u>Value</u>	<u>Average Workload</u>	<u>Primary Message Process Time Δ Available</u>	<u>AFFTE</u>
Incoming message	41,921	0.021 hrs	880.34 hrs	1652.37 hrs	0.533
Outgoing message	34,009	0.066 hrs	2,244.59 hrs	1652.37 hrs	1.358
Sec.RATT broadcast	N/A	0.035 hrs	0.00 hrs	1652.37 hrs	0.000
SITOR broadcast	1,080	0.035 hrs	37.80 hrs	1652.37 hrs	0.023
CW broadcast	948	0.069 hrs	65.41 hrs	1652.37 hrs	0.040
FAX broadcast	N/A	0.164 hrs	0.00 hrs	1652.37 hrs	0.000
Navy HF CW best	1,200	0.043 hrs	51.60 hrs	1652.37 hrs	0.031
NAVTEX broadcast	246	0.047 hrs	11.56 hrs	1652.37 hrs	0.007
Voice broadcast	960	0.127 hrs	121.92 hrs	1652.37 hrs	0.074
SITOR message	9,641	0.067 hrs	645.95 hrs	1652.37 hrs	0.391
RATT message	2,265	0.084 hrs	190.20 hrs	1464.00 hrs	0.130
HFDL message	2,728	0.061 hrs	166.41 hrs	1464.00 hrs	0.114
Phone Patch	0	0.181 hrs	0.00 hrs	1464.00 hrs	0.000
CW AMV/OBS	10,186	0.076 hrs	774.14 hrs	992.80 hrs	0.780
CW SAR	159	0.061 hrs	9.70 hrs	992.80 hrs	0.010
Voice SAR case	10	0.390 hrs	3.90 hrs	992.80 hrs	0.004
Air-to-Ground	N/A	N/A	N/A	N/A	0.000
500 KHZ CW	Guard	N/A	N/A	N/A	1.000
Voice Distress	Guard	N/A	N/A	N/A	1.000
TOTAL watchstander "non-combined" AFFTE				5.495	

APPENDIX E

TOTAL WORK AFFTE - The Consolidated Facility

<u>Primary Workload Factor</u>	<u>Unit Count</u>	<u>Value</u>	<u>Average Workload</u>	<u>Primary Message Process Time Available</u>	<u>AFFTE</u>
Incoming message	158,628	0.021 hrs	3,331.79 hrs	1652.37 hrs	2.016
Outgoing message	117,576	0.066 hrs	7,760.02 hrs	1652.37 hrs	4.696
Sec.RATT broadcast	24,136	0.035 hrs	844.76 hrs	1652.37 hrs	0.511
SITOR broadcast	3,136	0.035 hrs	109.76 hrs	1652.37 hrs	0.066
CW broadcast	7,567	0.069 hrs	522.12 hrs	1652.37 hrs	0.316
FAX broadcast	4,541	0.164 hrs	744.72 hrs	1652.37 hrs	0.451
Navy HF CW bcst	2,760	0.043 hrs	118.68 hrs	1652.37 hrs	0.072
NAVTEX broadcast	5,455	0.047 hrs	256.39 hrs	1652.37 hrs	0.155
Voice broadcast	7,412	0.127 hrs	941.32 hrs	1652.37 hrs	0.570
SITOR message	11,520	0.067 hrs	771.84 hrs	1652.37 hrs	0.467
RATT message	42,367	0.084 hrs	3,558.83 hrs	1464.00 hrs	2.431
HFDL message	5,789	0.061 hrs	353.13 hrs	1464.00 hrs	0.241
Phone Patch	322	0.181 hrs	58.28 hrs	1464.00 hrs	0.040
CW AMV/OBS	32,915	0.076 hrs	2,501.54 hrs	992.80 hrs	2.520
CW SAR	417	0.061 hrs	25.44 hrs	992.80 hrs	0.026
Voice SAR case	513	0.390 hrs	200.07 hrs	992.80 hrs	0.202
Air-to-Ground	Guard	N/A	N/A	N/A	1.000
500 KHZ CW	Guard	N/A	N/A	N/A	1.000
Voice Distress	Guard	N/A	N/A	N/A	1.000

TOTAL watchstander "non-combined" AFFTE **17.780**

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